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This newsletter is directed at providing assistance in keeping up with curriculum changes at the college level in the biological sciences. Provided are summaries of the biology programs of 47 colleges and universities. The summaries were invited from institutions where curriculum revision was known to be underway. The summaries are arranged alphabetically by institutions. The programs described range from those for general education to those for majors. Information includes program descriptions and a discussion of proposed or currently implemented curriculum changes. (RS)

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COMMISSION ON UNDERGRADUATE EDUCATION IN THE BIOLOGICAL SCIENCES

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FEB 21 1969
THE OHIO STATE UNIVERSITY
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THE EVER CHANGING CURRICULUM

The consideration and implementation of curriculum change is a normal function of a departmental faculty. Some departments have not varied their offerings for many years; others have kept their courses in continual upheaval. The best solution to keeping some semblance of continuity, yet assuring that information is up-to-date, probably lies somewhere between these two extremes.

CUEBS is interested in curriculum development, of course, and has attempted to keep tabs on various reforms across the country. This input of new ideas and information has helped to shape CUEBS programs and projects. Further, CUEBS has participated in many curriculum conferences. At the "St. Louis III" Conference in 1967 (see CUEBS Memo No. 67-41) curriculum summaries of the participating institutions were collected prior to the conference to serve as the basis for discussions.

This issue of *CUEBS News* is concerned with the same idea and uses the same approach. Summaries of the biology programs of 47 colleges and universities representing a broad spectrum of institutions are presented in the pages that follow. The summaries were invited from institutions where curriculum revision was known to be underway. Some of the institutions had been visited recently by members of the CUEBS (now AIBS/OBE) Consultant Bureau; others had received COSIP grants from the National Science Foundation to upgrade their curriculum offerings (see page 14). In addition, participants from the "St. Louis III" Conference were invited to update their summaries.

No attempt has been made to tabulate the material or to define trends. One is led to suspect, though, that it takes time, talent, money and good will to accomplish meaningful curriculum changes.

AUBURN UNIVERSITY, Auburn, Ala.

In 1969, Auburn University will abandon separate courses in introductory zoology and botany and will begin teaching general biology as a combined effort of the Departments of Botany and Plant Pathology and Zoology-Entomology. The following sequence of courses will be offered:

BIO 101 Principles of Biol. (5 qt. hrs., 4 hrs. lect., 2 hrs. lab.) Includes structure and function of the cell, reproduction, heredity, ecology and evolution.

BIO 102 Plant Biol. (5 qt. hrs., 4 hrs. lect., 2 hrs. lab.) An introduction to the morphology, physiology, relationships, distribution and importance of plants.

BIO 103 Animal Biol. (5 qt. hrs., 4 hrs. lect., 2 hrs. lab.) An introduction to the morphology, physiology, relationships, distribution and importance of animals.

BIO 104 Biol. in Human Affairs (5 qt. hrs., 5 hrs. lect., no lab.) The application of biological principles to an understanding of man as an organism and as a member of the ecosystem.

Students in the science and preprofessional curricula will be expected to take the 3 quarter BIO 101, 102, 103 sequence. Students from the Arts may take the 3 quarter sequence, but most will elect to take the 2 quarter sequence of BIO 101 and 104 which is designed especially for the non-major.

This program will be administered by a coordinator who will have his own budget and facilities. Staff will be provided by the participating departments, and no staff will belong exclusively to biology. Course scheduling will be by a committee composed of the Coordinator of Biology and the Head Professors of Zoology-Entomology and Botany and Plant Pathology. The Coordinator will be advised concerning course content, laboratory exercises and textbooks by a committee of senior professors. Laboratories and lecture halls will be separate from both Zoology and Botany.

Pilot courses will be taught during the spring and summer quarters of 1969, and all four courses will be taught in the fall quarter. A total of 5,000 students is expected in the program during an academic year.

The program of student majors will remain in the Zoology-Entomology and Botany and Plant Pathology Departments, and all courses above the general biology level will be taught in these Departments.

K. L. Hays, Professor, Department of Zoology-Entomology

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AUGUSTA COLLEGE, Augusta, Ga.

The following suggested sequence of courses is for biology majors taking a chemistry minor. A chemistry minor is, of course, not required. Underlined courses are not required unless chemistry is the chosen minor.

	Fall	Winter	Spring
First Year	Eng. 101	Eng. 102	Biol. 103
	Chem. 101	Chem. 102	Chem. 103
	Math 101	Math 102	Math 104 or Math 321
Second Year	Biol. 201*	Biol. 202*	Biol. 222*
	Chem. 281	Chem. 341	Chem. 342
	Hum. 221	Hum. 222	Hum. 223
Third Year	Biol. 301	Biol. 302	Biol. 304
	Phys. 201	Phys. 202	Phys. 203
	Pol. 101	Hist. 101	Soc. Elect.
Fourth Year	Biol. Elect.	Biol. Elect.	Biol. 498
	Biol. Elect.	Biol. Elect.	P. Chem.
	Soc. Elect.	Lang. 101	Lang. 102
			Elect.

*Note: Student must choose three courses from Biol. 201, 202, 222, 223. Course titles in biology are as follows: Biol. 103, Principles of Biology; 201, Invertebrate Zoology; 202, Vertebrate Zoology; 222, Plant Morphology I; 223, Plant Morphology II; 301, Cell & Molecular Biology; 302, Genetics; 304, Ecology; 498, Seminar.

Biology electives may be chosen from: Embryology, Comparative Vertebrate Anatomy, Principles of Physiology, Histology, Histological Techniques, Plant Anatomy, Plant Systematics, Plant Physiology, Biology Methodology, Selected Topics (varies from quarter to quarter), Undergraduate Research. The same biology curriculum is required of those planning to teach biology in a secondary school. In this case, the minor would be in secondary education with only one year of chemistry required. In addition to the above, service courses for non-biology majors are offered.

D. M. Morris, Chairman, Department of Biology

BELOIT COLLEGE, Beloit, Wisc.

Our great concern at the present time is in the general biology area where we are revising our two introductory courses. The catalog statements now read as follows:

Gen. Biol. I. A study of the basic principles of the biological world. Topics considered are basic structure, physiology, ecology, genetics, evolution, reproduction and development. Two lectures, one A-T lab, one discussion session weekly.

Gen. Biol. II. Designed primarily for students majoring in disciplines other than biology, this course pursues in greater detail some subjects introduced in Biology I but emphasizes the biology of man, including his position in and influence on the biosphere. Two lectures, one A-T lab, one discussion session weekly.

This arrangement of topics enables us to require only Biology I as an introduction for biology majors and to give Biology II as a follow-up course for non-majors. In this same area we have spent considerable time on the problem of advanced placement students who enter college with more than one year of high school biology.

Study is continuing on the combining of certain courses in the curriculum, e.g., two ecology courses have been combined into the General Ecology course, and plans are being formulated for combining the Vertebrate Embryology and Comparative Anatomy courses.

Efforts are being made in many upperclass courses to do more than the traditional laboratory work by involving the students in investigative problem work wherever possible. The Comparative Physiology course is a good example of success in this area. Here students are using modern techniques and instrumentation as they do their investigative problem work. Some preliminary work is underway to explore the possibility of giving more credit to students for laboratory courses where they spend at least twice as much time in the classroom and laboratory as they do, say, in their humanity and social science courses.

Biology majors may follow either of two curricula: Form A (regular biology major) or Form B (preprofessional biology major). Each Form involves a minimum of 12 full courses. Form A provides a basic background for students anticipating graduate study in various fields of biological sciences, in allied fields such as conservation and wildlife management or in secondary school teaching. Form B is designed primarily for students planning careers in the medical professions and for students anticipating graduate study in physiology, molecular or marine biology. The following are minimum requirements:

1. Departmental unit. Completion of 8 (Form A) or 6 (Form B) full courses, including General Biology I, General Ecology, Genetics, Microbiology or Cell Biology and Plant Physiology or Comparative Physiology.

2. Supporting courses unit. An additional 4 full courses (Form A) or 6 full courses (Form B) will be chosen in consultation with the major advisor. These will normally include a minimum of 2 full courses in chemistry with the remaining courses selected from the fields of chemistry, geology, mathematics, physics and psychology.

3. Comprehensive evaluation. Each senior must arrange to write the Biology Section of the GRE and must participate in the Departmental Evaluation Seminar. The student's performance in each of these constitutes the basis for the departmental comprehensive evaluation.

B. K. Kunny, Chairman, Department of Biology

BEMIDJI STATE COLLEGE, Bemidji, Minn.

A single one year general biology course, with emphasis on concepts and the implications of biology for mankind, is offered both for majors and for general education, basically because we feel that majors as well as non-majors need a liberal education in biology. We hope to offer General Biology laboratory as a separate one quarter course, not tied to any particular quarter of General Biology lecture. Beyond General Biology, only two courses are required of all majors: Genetics and Literature of Biology. The remaining courses must be selected from the following three areas: morphology and taxonomy, physiology and environmental biology. There is no extensive required core, because we feel that the diversity of goals open to a biology major is best approached by tailoring the program to the individual student. A total of 55 quarter hours is required for the major.

The biology major may lead to three degrees: BS in Education (Secondary), BA and BS in Biology (proposed). The new BA involves an extensive liberal arts core (about one-half of undergraduate requirement), and it is expected that few students who plan to enter graduate programs in biology will choose the BA curriculum. No minor is required for the BA, but at least a year of chemistry or physics is prerequisite to courses in the physiology area. The BA is offered in all of the sciences because the faculty considers the sciences as relevant for a liberal education as any of the other liberal arts.

A minor in chemistry, physics or earth science plus math through calculus and statistics is urged but not required for the BS in Education. General education, a major, a minor and education requirements combine to make this a very tight program. Biology courses are also required in three other programs: medical technology, biology concentration for elementary teachers and a proposed outdoor education minor. All three involve selections from the same courses that are available to biology majors. Special courses in human anatomy and human physiology are offered for P.E. majors.

Students who plan to do graduate work will most often select the proposed BS in Biology. A minor in chemistry, physics, earth science or psychology will be required; and, whatever the minor, chemistry through biochemistry, math through calculus plus statistics and a year of physics will probably be required.

Some reduction in the number of courses presently offered is expected, and laboratory may be separated from lecture in a number of subjects, as it already has been in Genetics. There will be an increasing emphasis on undergraduate research.

E. B. Hazard, Professor of Biology

BRANDEIS UNIVERSITY, Waltham, Mass.

The Biology Department is in the process of revising its curriculum. The revisions have not yet been adopted. We are still operating under the old plan, which I shall outline briefly.

There is an undergraduate introductory course which is open to sophomores (also people who can pass a placement exam; can be avoided by people who pass another type of placement exam). There is also a separate course for non-science majors (general education requirement). This has now been modified so that students have some choice with respect to how single semester offerings may be combined with similar courses in other sciences. There are some experimental sections which satisfy the requirements for this course. These are devoted to a review of research papers.

Majors, having taken the introductory course or passed a placement exam, then take a core of three courses: Genetics, Cell Physiology and Developmental Biology. Two additional elective courses in biology are required for completion of the major. About 8-10 courses are available: Microbiology, Developmental Genetics, Invertebrate Physiology, Comparative Anatomy, Vertebrate Physiology, etc.

Our changes will probably involve the offering of Introductory Biology in the freshman year, possibly alternative cores, etc.

E. Zwilling, Professor of Biology

CALIFORNIA STATE COLLEGE, San Bernardino, Cal.

The College is now completing its fourth year of operation. Curriculum evaluation and revision remains paramount among our departmental duties. Two changes have been made in our major recently; both have provided for more flexibility in the student's selection of elective courses. Most of our students come to us with a strong high school background in mathematics; therefore, instead of requiring three mathematics courses, we require only one. The other change concerns the reduction from two organismic courses to one in our core program. The major now requires the completion of the following: statistics, physics (2 qts.), chemistry (4 qts.), introductory biology (2 qts.), organismic biology (1 qt.), upper division core courses (5 qts.), upper division electives chosen from biology and/or related sciences (4 qts.) and a passing grade on the departmental comprehensive examination.

Beyond the core, the student may enter specialized courses in biology developed to follow naturally the core courses, engage in independent study of biological phenomena (either as a separate experimental problem or as part of an on-going research program) and/or seek out further basic information and concepts in the related sciences.

A. S. Egge, Coordinator, Department of Biology

CENTRAL STATE UNIVERSITY, Wilberforce, Ohio

The undergraduate curricular plans in the Department of Biology are:
1. To reduce the fragmentation and unrelatedness of the curriculum by deleting those courses which are not essential for a sound undergraduate program in biology.

2. To amalgamate those courses which are closely related but traditionally taught as specialty courses.

3. To further develop the area of plant sciences.

4. To further strengthen the A-T program in general biology offered primarily to non-biology majors.

Specific changes:

1. Advanced General Botany and Local Flora are combined in a one quarter field biology course.

2. Parisitology has been deleted.

3. Histology, Comparative Vertebrate Anatomy and Vertebrate Embryology are combined into a two quarter Vertebrate Structure and Function course.

4. Plant science area now includes: General Botany, General Plant Pathology and Plant Physiology.

5. The required core courses are: Fundamentals of Biology (1 qt.), General Botany (1 qt.), General Zoology (1 qt.).

6. Other electives offered by the Department are: Cellular Biology, Genetics, Entomology, Microbiology, Laboratory Techniques, Seminar, Vertebrate Physiology, Ecology and Radiation Biology.

Noted Achievements:

The installation of a 28 booth A-T laboratory complex has given a new dimension in creating and sustaining motivation and interest in the life sciences by students who elect biology as part of their general education program. The University is very pleased with this system, and plans are being developed for its expansion.

D. T. Holmes, Dean, College of Arts and Sciences

CENTRE COLLEGE OF KENTUCKY, Danville, Ky.

In the fall of 1967, the college began an extensive reformation of its curriculum. The changes involve both the content and format of the academic program. They have been accompanied by a restructuring of the school calendar and the grading system. The new curriculum is being implemented, one class level at a time, over a four year period. The new curriculum combines the advantages of interdisciplinary general study with intensive study in a specific discipline. In the first two years, a student's work is a combination of study in interdisciplinary core programs and seminar opportunities in specific fields. In the junior and senior years the student concentrates in a major field of study supplemented by an advanced program designed to integrate his academic work for all his college years. In addition to traditional majors, many interdisciplinary majors are being offered.

The new calendar on which this curriculum is framed consists of fall and spring terms of 13 weeks each, separated by a winter term of 6½ weeks. The student takes 10 courses per year, in the pattern of 4-2-4, fall-winter-spring.

The normal weekly calendar during the long terms consists of two 90-minute class meetings per week for each course, with no scheduled classes on Wednesdays or Saturdays. The winter term, in which each of the two courses taken meets in four 90-minute sessions per week, is designed primarily for independent study projects, seminars and specialized courses, intensive language and math courses and off-campus studies. All courses are credited equally. This means that science courses, if they utilize a lab, are expected to take no greater a share of the student's total time than are non-science courses. Graduation requirements include satisfactory completion of 38 term courses.

Academically, the college is organized into four major divisions: Humanities, Social Studies, Scientific Studies, Mathematics and Foreign Languages. Each of these divisions develops two programs of study (e.g., in the Science Division these are Life Science and Molecular Science). The freshman is required to take one course program from each division during each of the long terms. He is further required to continue into the sophomore level two of the programs which he chose as a freshman. By the end of his sophomore year he must also have passed proficiency exams in math and foreign language. (The majority of our students pass at least one of these before matriculating.)

In the Life Science program, the freshman course, Life of the Organism, studies the individual organism at successively higher levels of organization, from the molecular to the behavioral. In so doing, it integrates much of the material which is normally covered in introductory courses in biology and psychology.

The frame of reference is shifted in the sophomore year, as indicated by the course title, Organisms in Populations, which studies populations as fundamental genetic, ecological and social units. The Life Science program in the sophomore year also offers single-term courses in Experimental Design, Human Growth and Development, Systematics and Advanced General Psychology.

The major programs in the Life Sciences (Psychology, Psychobiology, Biology and Molecular Biology/Biochemistry) have somewhat varied requirements, but all will require at least one term of directed study in laboratory experimentation, one term of a comprehensive senior seminar to be offered in each of the four disciplines, and four terms of advanced junior-senior courses, in addition to the freshman-sophomore core programs.

B. T. Feese, Chairman, Life Science Program Committee

COLGATE UNIVERSITY, Hamilton, N. Y.

Traditionally, biology has almost consciously stressed the diversity of living things. The disciplines of evolution, taxonomy, histology, embryology, etc. emphasize the subdivisions of biology and foster specialization with a necessary narrowness of field and interest. In an effort to present biology as a unified discipline, it has become increasingly evident that the theme of unity must assume major importance. Major concepts applicable to all living things should be predominant in our curriculum.

With the above in mind, the Biology Department has entered into discussions concerning curricular revision in keeping with newer developments in the field. The following summary of a proposed curriculum is the result of such discussions. For various reasons, implementation of these proposed changes has not yet taken place.

In brief, we propose a required set of 4 or 5 core courses for all biology students. Our purpose, of course, is to lay the necessary conceptual framework for subsequent specialty courses available in the junior or senior years.

These core courses are visualized as follows:

1. Principles of Biology. Presentation of biology in broad perspective; to include such topics as origin of life, reproduction, heredity, interrelationship of structure and function, interrelationship of living things to their environment.

2. The Organism. Includes principles of taxonomy and phylogeny, survey of plant and animal kingdoms, anatomy, evolution, digestion, excretion, respiration, etc.

3. Biological Organization and Control. Concepts of Mendelian genetics, morphology, growth and development, reproduction, tissue and organ structure, neural and endocrine control mechanisms, feedback and cybernetics.

4. Molecular and Cellular Biology. Concepts of biochemistry and biophysics of cells, nutrition, metabolism and energy transfer, molecular genetics, cellular anatomy and physiology, cytology and ultrastructure.

5. Environment and Biological Interactions. Studies of populations genetics and dynamics, environmental adaptations, evolution, behavior, ecology, history and philosophy of biology, human values, etc.

R. A. Hoffman, Department of Biology

COLLEGE OF THE VIRGIN ISLANDS, St. Thomas, V. I.

The college began as a two-year institution in July, 1963, with occupational and university transfer programs. Now in its sixth year of operation, it is developing curriculums in several fields, including biology, and will award the first baccalaureate degrees in June, 1971.

1. The biology major—required courses:

General Biology	8 sem. hr.
Microbiology	4 sem. hr.
Genetics	3 sem. hr.
Ecology or Invertebrate Zoology	4 sem. hr.
Comparative Vertebrate Zoology	4 sem. hr.
General Physiology	4 sem. hr.
Animal Embryology	4 sem. hr.

2. Botany. In the fall of 1970, several botany courses will be introduced. The major will then have a choice in emphases: zoology or botany. Required courses for concentration in botany will include Ecology, Plant Morphology, Plant Physiology and Local Flora. Marine Botany will also be offered.

3. Medical Technology. In cooperation with the Virgin Islands Department of Health, the College has planned a curriculum for premedical technologists. This will be a three year program with transfer to a certified laboratory training school.

4. Marine Science. Still in the planning stage is an undergraduate marine science program. The location of the College provides a unique opportunity for the development of such a program. In the first two years, students will take basic mathematics and science courses, leading to more specifically marine-oriented courses in the junior and senior years. The curriculum is expected to be finalized by the spring of 1970.

H. W. Gjessing, Acting Dean of the College

DARTMOUTH COLLEGE, Hanover, N. H.

Our core curriculum, as detailed in CUEBS Publ. No. 18, has continued to evolve, reflecting what we feel to be significant developments in biology. It continues to attract an increasing number of majors, all of whom have performed well on the objective criteria of Graduate Record Examinations and graduate school admissions. The present major program includes a two term prerequisite course, Introduction to the Biological Sciences, a one term course in Environmental Biology, and a two term course in Cellular Biology. Topics in genetics are considered, as appropriate, in all three courses; topics in development in the first and third. The major further specifies one course each in a plant and animal science, with choices ranging from molecular to population studies, and five electives chosen from among the total offerings of the department. Exemption from the prerequisite, introductory course, is possible by either a College Board or local placement examination. This option, plus the limited number of specified courses, allows a student maximum opportunity to select his own area of specialization while assuring a degree of biological breadth.

T. B. Roos, Department of Biological Sciences

DUKE UNIVERSITY, Durham, N. C.

There is no core program in biology; attempts to plan such a program have failed because a core course approach is unnecessary within the context of the Departments of Botany and Zoology. Both departments adhere firmly to the principle of the broadest possible intradisciplinary training for the bulk of the undergraduate majors, but with the possibility of two alternatives: (1) specialization for students who declare specific interests early or (2) an interdisciplinary major leading toward later specialization in such fields as biophysics, biomathematics or oceanography.

In both departments, most courses maintain a balance between the descriptive and experimental approach. This is necessary for two reasons. First, the preclinical areas which control biochemistry are unwilling to teach undergraduates; hence, the botany and zoology faculties must assume this burden. Second, we maintain that students must have the tools to enable them to understand biological phenomena; those tools come from the descriptive as well as the experimental approach, and to emphasize one at the expense of the other constitutes narrow rather than liberal education. Courses are thus tailored to our particular administrative and academic structure with which we are comfortable.

The Departments of Botany and Zoology, with botany having the chief administrative responsibility, offer a one year introductory biology course. This course, modified from but nevertheless paralleling conventional lines, takes a broad approach. The Department of Zoology offers a one year zoology course organized on the living systems approach and is designed for the student who has a prerequisite background in physics and chemistry. Either course serves as the prerequisite for entry into the advanced course programs of either department. The courses are mutually exclusive and are not competitive.

The University's entire undergraduate curriculum requirements have been modified to (1) incorporate a four-course load, (2) reduce required courses and (3) provide programs for the development of specific curricula for individual students. This change allows more flexibility for inter- and intradepartmental curricular changes. It also encourages either breadth in training or specialization at an early stage, depending on the needs and interests of the undergraduate. Effective date: September, 1969.

T. W. Johnson, Jr., Chairman, Department of Botany

EAST CAROLINA UNIVERSITY, Greenville, N. C.

A completely revised biology curriculum was initiated last fall. This resulted from several years of planning, which was culminated by a visit from a CUEBS Consultant. All students now take Principles of Biology I and II. Non-majors complete their three quarter sequence by electing either Biology of the Environment or a non-laboratory course, Perspectives in Biology. Majors continue in a core sequence which stresses principles and covers three areas beyond the freshman courses: organismic biology, metabolism and homeostasis and environmental biology. Majors also elect four additional upper division courses plus a senior level, lecture-seminar course in Principles of Biology III. Courses in cognate areas vary with the degree, but a year of organic chemistry is required for all majors.

A BS in Biochemistry is also offered by the Biology Department. Science and mathematics requirements are as follows:

Principles of Biology I and II	8 cr.
Principles of Growth and Development	4 cr.
Principles of Biochemistry	4 cr.
Intermediary Metabolism	4 cr.
Proteins and Nucleic Acids	4 cr.
Ecology	4 cr.
Principles of Biology III	3 cr.
General & Qualitative Chemistry	12 cr.
Organic Chemistry	15 cr.
Physical Chemistry	12 cr.
Mathematics through Integral Calculus	25 cr.
General Physics	15 cr.
Additional science/math electives	12 cr.
Total	122 cr.

G. J. Davis, Chairman, Department of Biology

FRANKLIN AND MARSHALL COLLEGE, Lancaster, Pa.

Students majoring in biology begin studies in their field of concentration in their sophomore year. They have prepared for this in their freshman year with two semesters of general chemistry and two of mathematics. Biology I (essentially cellular biology) and Biology II (essentially organisms, their diversity and their relations with the environment) follow in the sophomore year. Organic chemistry is taken simultaneously with these courses. Genetics is the third course and is taken in the first semester of the junior year. It is followed by Developmental Biology. Two semesters of physics are taken simultaneously. General Physiology in the first semester of the senior year completes the sequence of five courses required of all biology majors. An additional three electives in biology are also required, most of which will be taken in the senior year. Certain students are encouraged to substitute courses in advanced mathematics, chemistry or physics for one or more of the electives in biology.

The following summarizes the curriculum:

Year	*First Semester*	*Second Semester*
Freshman	General Chemistry Mathematics	General Chemistry Mathematics
Sophomore	Biology I Organic Chemistry	Biology II Organic Chemistry
Junior	Genetics Physics	Developmental Biology Physics
Senior	General Physiology Biology elective	Biology elective Biology elective

Note 1. Certain students may substitute advanced courses in mathematics, chemistry or physics for one or more biology electives.

Note 2. Electives in biology are Advanced Physiology, Ecology, Microbiology, Parasitology, Vertebrate Anatomy, Plant Morphology, Advanced Botany, Topics in Biology, Problems in Biology and Honors Research.

Note 3. The department also offers two semesters of General Biology for non-majors.

Note 4. The College is on the course system, i.e., all courses are equivalent, and each student takes four courses each semester.

J. J. McDermott, Chairman, Department of Biology

GETTYSBURG COLLEGE, Gettysburg, Pa.

Beginning with the AY 1969-70, we will shift to a course system, having a calendar with two, four course terms, separated by a one course January term.

Under the new calendar, a minimum of eight biology courses will be required to complete the major. (The minimum is exclusive of any January term course and Independent Study.) Beyond General Biology, no specific courses are required for the major, but specialization at the expense of breadth is discouraged. Chemistry and mathematics are required allied courses. The following courses are offered: General Biology, Comparative Anatomy of Vertebrates, Genetics, Microtechnique, Protistan Biology, Biology of the Embryophytes, Ecology, Organization of Cells and Tissues, Biology of Development, Parasitology, Vertebrate Zoology, Invertebrate Zoology, General Microbiology, Plant Physiology, Animal Physiology, Cell Physiology, Biochemistry (for students who do not plan to take biochemistry at graduate level), Introduction to Paleontology, Evolution and Systematics, Independent Study.

During the January term the following courses will be offered: Adaptive Diversity (comparison of adaptive physiology and morphology of gastropods and legumes, may be taken by non-science majors in place of second term of General Biology); Physiology and Psychology of Sensation; Radiation and Life; Experimental Morphology; Tropical Biology (field study in Chiapas, Mexico); Mushrooms, Molds and Man; Man's Use of Bacteria.

R. D. Barnes, Chairman, Department of Biology

HAMPDEN-SYDNEY COLLEGE, Hampden-Sydney, Va.

All undergraduates take the following biology course regardless of their eventual major:

Biol. 103 (4 cr.). An introduction to biological phenomena that contribute to man's appreciation of his environment. Topics include a study of molecular and Mendelian genetics, animal and plant evolution and biotic interrelationships.

Most natural science majors continue with the following course:

Biol. 104 (4 cr.). An introduction to the molecular, anatomical, physiological and related homeostatic phenomena of living organisms with an emphasis placed on higher plants and animals.

All biology majors and most premeds. continue with the following: Genetics (4 cr.), Comparative Anatomy (4 cr.), Plant Ecology (4 cr.), Embryology (5 cr.).

All biology students must take an additional 8-10 hours of biology courses from one of two course lists. Students interested in natural history, conservation, ecology and similar aspects of the field select from the following list of courses: Animal Ecology (4 cr.), Plant Physiology (4 cr.), Invertebrate Zoology (4 cr.), Seminar on the biographies of famous biologists (2 cr.), Birds and Mammals (4 cr.). Students interested in physiology, biochemistry and related disciplines select from the following: Biochemistry and Cell Physiology (8 cr.), Microbiology (A-T) (4 cr.), Seminar in Comparative Animal Physiology (2 cr.).

In addition to the above mentioned courses, honors work is available for 1-2 hours of credit per semester. The biology major consists of 34-36 hours in the department. In addition to this, we require chemistry through organic, math through calculus and, if time permits, a year of physics.

T. H. Turney, Associate Professor of Biology

INDIANA UNIVERSITY, Bloomington, Ind.

In addition to majors in the Departments of Anatomy-Physiology, Botany, Microbiology and Zoology, the Division of Biological Sciences offers an interdisciplinary BS degree. This degree is designed for the student who has the academic ability to attain, as an adjunct to his undergraduate education in biology, a thorough background in mathematics and the physical sciences and who probably will continue his education in biology or medicine at the graduate level.

The interdisciplinary core curriculum begins at the earliest in the sophomore year with Subcellular and Cellular Biology (5 cr.) and proceeds sequentially through Genetic Biology (5 cr.), Developmental Biology (5 cr.), Organismal Biology (5 cr.) and Population Biology (5 cr.). During the freshman year while fulfilling part of the prerequisites in mathematics and chemistry, students may enroll in a colloquium, Current Problems in Biology (1 cr.). In this course, a large number of the faculty in the Division explain their current research efforts in relation to the broad areas of biological investigations. In the cognate sciences, the minimum requirements are calculus (10 cr.), chemistry (20 cr.) and physics (10 cr.). Many of these serve as prerequisites for the courses in the biology core curriculum.

In addition to the general group requirements in the humanities, social sciences and foreign languages, electives are available in advanced undergraduate courses in the various departmental programs within the Division of Biological Sciences. Invariably, students completing the core curriculum enroll in graduate courses in biology and/or chemistry, or they may enroll in Honors Research which usually results in a senior thesis.

W. A. Konetzka, Coordinator for Undergraduate Programs in Biology

KANSAS STATE UNIVERSITY, Manhattan, Kan.

As a result of the merger of the separate Departments of Bacteriology, Botany and Zoology into the Division of Biology, our curriculum revision effort has been primarily aimed at the development of a biology major. Beginning in the fall of 1968, a new introductory year of biology was initiated. The first semester, Principles of Biology (5 cr.), is presented by the audio-tutorial approach. This course is open to majors and non-majors alike; we feel that there should be no difference in content or approach at the introductory level between these two groups of students. The second course in this year is Organismic Biology (3 cr.).

A non-major, non-laboratory, two semester sequence in Biology and a semester each of General Botany and General Zoology are still being offered. No decision as to the fate of these courses has been made.

Further course revisions arising out of the formation of the Division have resulted in the offering of Environmental Biology in the junior year, replacing the separate Plant and Animal Ecology courses, and the presentation of Molecular Genetics in the senior year, replacing, in part, several courses in biophysics once taught by Division faculty who were then members of the Department of Physics. Additionally, we plan to submit a course in Evolution in the senior year and new courses in the areas of cellular and developmental biology in the junior year to complete the offerings required for the biology major. In time, we plan to reduce the other undergraduate courses being offered, either by further mergers and eliminations or by decreasing the number of times a course is scheduled. These changes are being made, however, with full awareness of our responsibilities to other curricula within a Land Grant University such as ours so that we will indeed be maintaining courses that provide service functions to other departments.

We have purposely left the sophomore year free of any biology courses. We find that this facilitates transfer of students into our program from within the University as well as from the Junior Colleges. This open year also provides the opportunity for our own majors to complete their mathematics, chemistry and physics requirements prior to their entry into the advanced courses in biology offered in the junior and senior years.

Since we have a number of other majors within the Division of Biology (e.g., wildlife conservation, bacteriology) we have not attempted to develop a core curriculum. Yet we fully expect that Principles of Biology and Organismic Biology and perhaps also Cell Biology and Environmental Biology will, in practice, be common to all our majors.

J. L. Zimmerman, Chairman, Biology Curriculum Committee

KENT STATE UNIVERSITY, Kent, Ohio

The department is currently revising its undergraduate biology curriculum for majors. This revision has been greatly facilitated by a representative of the CUEBS Consultant Bureau. Two Teaching Development Awards granted by the University provided time and money for the development of the core proposal. Two departmental committees on curriculum revision also contributed greatly.

The following proposal is now being considered by the Department of Biological Sciences and as yet has not been accepted in its entirety. However, the innovation of this core as a theme approach has been accepted by the staff.

1. Five sequential courses will be included in the core: Reproduction, Energy Transformations, Development and Specialization, Regulating Mechanisms and Adaptation. A sixth independent investigation course will be optional and will probably extend over two or three quarters.

2. The topics in each core course will be taught at all levels of biological organization, where possible; thus in the course on Regulating Mechanisms, mechanisms that regulate biological processes at the molecular, cellular, organismal, population and ecosystem levels will be discussed. With this format, students should more easily learn the structure of their discipline.

3. Students will enter the core at the beginning of their sophomore year, taking chemistry and mathematics as freshmen. Certain specialty courses in the department may be taken concomitantly with the core courses.

4. The number of hours required for the major will be 40 (25 hrs. in the core and 15 hrs. of biology electives).

5. The philosophy of the core curriculum will stress inquiry and discovery as opposed to the rote memorization of facts; it will emphasize student intellectual maturity and self-reliance. Thus, the purpose of the lectures will not be to purvey factual information but, instead, to clarify relationships between facts and to relate these to meaningful generalizations. Discussion groups not to exceed 10 students will meet twice a week with permanent staff members. In general, lectures will be de-emphasized, and discussion groups and independent reading will be emphasized.

6. This core has been designed primarily for those majors who will continue for advanced degrees in biology. A separate track will be maintained for non-majors and for non-professional majors such as medical technology and physical therapy students.

L. P. Orr, Professor of Biological Sciences

McNEESE STATE COLLEGE, Lake Charles, La.

In September 1968, a two semester, 4 credit hour introductory biology course (General Biology 101-102) was initiated. It replaced all of the following courses:

Biol. 101* (Intro. to Plant Life)	3 cr.
Biol. 105* (Intro. to Plant Life Lab)	1 cr.
Biol. 111* (Intro. to Animal Life)	3 cr.
Biol. 115* (Intro. to Animal Life Lab)	1 cr.
Bot. 101 (Gen. Bot.)	4 cr.
Bot. 102 (Gen. Bot.)	4 cr.
Zool. 101 (Gen. Zool.)	4 cr.
Zool. 102 (Gen. Zool.)	4 cr.

* for non-majors

The new course requires a laboratory, is addressed to both majors and non-majors, and is a prerequisite for all courses in the department.

The following curriculums are offered in the Department of Biological Sciences: medical technology, botany, predental and premedical, zoology and pre-pharmacy and pre-optometry. Within the past two years, since plans have been made to move to the new biology course, there have been a number of curriculum changes in all five areas, more particularly in the botany and zoology curriculums. These changes have involved upper division courses and have included the following as objectives:

1. Addition of new courses or restructuring of existing courses at the sophomore level to accommodate majors who may need transitional courses to bring them up to most advanced biology course levels. Changes involve course numbers, descriptions and credit hours.

2. Updating the five curriculums by the deletion of courses which have rarely or never been taught, and by adding pertinent courses according to faculty training and experience.

G. H. Dukes, Jr., Chairman, Department of Biological Sciences

MARIAN COLLEGE, Indianapolis, Ind.

The biology curriculum consists of a core program of 24 hours plus 8 hours selected from other courses in the field. This program includes a one semester course for all students selecting biology either for general education or as a major. This is a basic course but considerably beyond that which is ordinarily given in the secondary schools from which students come to Marian College. Majors then continue their biology in the second semester where human anatomy and physiology are thoroughly treated. Sophomore year the students take Organismic I (zoology) and Organismic II (botany). All students take Genetics, Ecology and Seminar. The Seminar is given the second semester of the junior year. Its purpose is to introduce the students to the literature of biology and give experience in using the literature and writing a scientific paper. It can serve as preparatory for independent study the first semester of the senior year. All majors take additional work in chemistry, and/or physics and mathematics.

One change that the overall college program has made recently is that all students take 12 hours of science for general education; four hours in each of three areas: chemistry, biology, physics and mathematics. This is the first year of experimenting, and it is difficult at this time to judge the program.

Sister Marie Bernard, Chairman, Department of Biology

MARYVILLE COLLEGE, Maryville, Tenn.

In the fall of 1967, an entirely new program involving an integrated approach to science was initiated. Two new courses are required of all freshmen. Science Thought deals with the methods and limitations of science and the relationship of science to socio-political mores. Science Fundamentals is concerned with the relationships between matter and energy; the major topics include matter as units, matter as bulk and matter and the living system. All prospective science majors take, in addition, two courses in mathematics.

The curricula for chemistry, physics and biology majors are based upon this foundation. Each program is limited to 10 courses, two of which must be research. Few electives are available within each discipline, and only two are permitted.

The biology program includes Genetics, Invertebrate Zoology, Plant Taxonomy, Developmental Biology, Vertebrate Zoology, Cytology, Physiology and Ecology. A field course, taken at a cooperative field biology center on Norris Lake, may be substituted for Ecology or Plant Taxonomy.

Laboratory work in all the biology courses is unscheduled, but written and oral reports are required. During the junior and senior year the major is assigned work space which is available to him around the clock. The staff keeps close contact with the progress of the laboratory exercises, and we find we have much more individual contact than previously. Certain exercises (e.g., field work) demand team participation, and the students generally organize these activities to suit their schedules.

The college calendar consists of three 10 week and one 4 week terms. The student carries 3 courses/10 week term. The 4 week term is for independent work. During the senior year, each biology major uses this 4 week term to pursue fulltime any aspect of biology he chooses. Usually he selects a topic he has not had an opportunity to study during his course work.

From the first freshman class (1967-68) in this program, the number of students declaring majors in the sciences increased 100% over the previous year.

A. R. Shields, Chairman, Department of Biology

NORTH TEXAS STATE UNIVERSITY, Denton, Texas

The Department of Biology initiated a core curriculum in the biological sciences leading to the baccalaureate degree in the fall of 1967. The remainder of the core curriculum will be initiated in the fall of 1969. The core is as follows: Principles of Animal Biology, Principles of Plant Biology, Microbiology, Environmental Biology, Developmental Biology, Cellular Biology, Genetics and a physiology course selected from mammalian, cellular, bacterial or plant.

An additional 6 hours of advanced biology is required, chosen by the student in conference with his advisor. The first minor is chemistry, comprised of Inorganic Chemistry, Organic Chemistry and either Biochemistry or Physical Chemistry. Other science requirements are 8 hours of physics and 6 hours of mathematics. Additional requirements for the bachelor's degree are similar to those in other institutions, comprised of languages, political science and the humanities. The core curriculum described above leads to the BS degree, a total of 130 hours. In the event a student requires a BA degree, the core consists of the first four courses listed above, and the total number of hours in the biological sciences is reduced by 8 hours. Other requirements remain the same. The 8 hours reduction in the BA degree program permits more hours of electives for a broader general education program.

J. K. G. Silvey, Chairman, Department of Biology

NORTHWESTERN STATE COLLEGE, Natchitoches, La.

After a number of years of experimentation and study, the biology staff has made three significant changes in the undergraduate departmental curricula.

Originally, the following introductory biology courses were used: a semester each of botany and zoology for science majors, a lecture-laboratory general biology course for elementary education majors and a non-laboratory course for all other students. Now all students, both majors and non-majors, take a new conceptually oriented, 6 semester hour General Biology course. The course encompasses two semesters with two lectures and one, two hour laboratory each week.

Several staff members felt that this plan would allow insufficient contact between the staff and freshman majors and that 6 semester hours of General Biology was inadequate. This reasoning led to the second curriculum change.

Readings in Biology (one semester hour for each of two semesters) was introduced. This course is required of all biology majors and minors and may be elected by other students taking General Biology. *Scientific American* offprints are selected to accompany major topics as they are developed in the General Biology course.

Majors in all of the degree curricula in biology are required to select at least one course from each of the following four core areas: genetics, morphology and development, physiology and environmental biology.

The following undergraduate degree curricula are available to biology majors: biology education, botany, medical technology, wildlife management and zoology. Premedical and predental students major in zoology and minor in chemistry. A two year, non-degree program was recently begun in Cytotechnology.

W. G. Erwin, Chairman, Department of Biological Sciences

OKLAHOMA STATE UNIVERSITY, Stillwater, Okla.

A faculty committee has recently been appointed to make recommendations relative to the curricula in biological sciences. In addition to representatives from the Departments of Botany and Plant Pathology, Microbiology, Physiology and Zoology, faculty members from Agriculture, Education, Forestry and Psychology will give attention to 1) the elementary courses for non-majors and the various biological majors; 2) intermediate courses in such areas as genetics, cellular and molecular biology and environmental and population biology. The possibility of interdisciplinary graduate programs will also be considered. No consolidation of the existing departments within the College of Arts and Sciences is anticipated at this time, although it is assumed that a common core curriculum will be developed, and a separate major in biology will be presented, as opposed to one comprised of selected courses in each of the existing departments. The only general biology course presently offered is a non-laboratory course for non-majors.

G. A. Gries, Dean, College of Arts and Sciences

REED COLLEGE, Portland, Ore.

The present curriculum is designed to establish a broad base and understanding of biology fundamentals and then to permit the upper division student to begin some specialization and research along his own interests. The aim is to furnish students who wish to specialize in biology a sound foundation in the subject matter, theory and methods of contemporary biology and, at the same time, to give them an opportunity to acquire a substantial background in the liberal arts. To this end, excessive specialization in courses within the Department of Biology is not encouraged. Requirements for a major are Beginning Biology Lectures (1 sem. equivalent) and Senior Thesis (2 sem.), 2 semesters each of mathematics and physics, 4 semesters of chemistry plus at least 5 semester courses in biology (Developmental Biology of Chordates, Invertebrate Zoology, Plant Physiology, Plant Evolution, Microbiology, Genetics, Cellular Biology, Animal Physiology) or plus at least 4 of these semester courses in biology and one full semester course in advanced chemistry or physics.

In addition, each junior is encouraged to sign up for a Special Topics course (a ½ sem. equivalent) for a research project designed for the student in the general area of the research activities of a faculty member. This is considered an introduction to research under relatively close tutorial direction; the research project of the Senior Thesis represents a more independent research program. The Senior Thesis represents roughly ⅓ to ¼ of the senior program and is required of all Reed students.

A program initiated this year is concerned with a seminar (in addition to a regular departmental seminar) involving post-doctoral fellows and a visiting lecturer series. The subject matter will vary from year to year, but it is based this year on recent considerations in ecology, an area not adequately covered in our present curriculum.

H. A. Stafford, Professor of Biology

POLYTECHNIC INSTITUTE OF BROOKLYN, Brooklyn, N. Y.

To help meet the important new challenges in the life sciences and medicine, two undergraduate curricula have been developed, one leading to a BS in Premedicine, the other to a BS in Biology. Both of these highly science-oriented curricula permit the integration of biologically and medically oriented sciences with the physical sciences, mathematics and engineering through the specialized experiences and scientific facilities of the Institute. The offerings have been developed to strengthen our endeavors in the areas of molecular biology and bioengineering. Both curricula are designed to present basic concepts and principles of the life sciences, reflecting modern biology and its interrelationships with other scientific disciplines. Information presented is directed toward all levels in the complexity of organization from molecules, macromolecules, organelles, cells, organisms and populations. As the general approach is problem-oriented, each student is encouraged to design and carry out individual projects as part of the course of study. Senior students may elect to carry out an original research investigation under faculty guidance in partial fulfillment of degree requirements. It is suggested that students elect courses in electronics, computers and systems analysis to provide new analytical approaches and opportunities unique to the Institute.

The premedical curriculum provides a well-rounded humanities program as well as a substantial scientific background. Sufficient flexibility has been introduced into the course of study to meet the interests of the individual student and provide a firm background for graduate work. The breadth and flexibility of the curriculum, encompassing 40 credits of humanities, includes 14 in English, 3 in economics, 3 in history and 12 in language. It is recommended that 8 credits of humanities electives be selected from psychology, social psychology and anthropology. The scientific orientation includes a minimum of 12 in biology, 12 in physics, 16 in mathematics and 26 in chemistry. Required course offerings include Calculus, Differential Equations, Probability and Statistics, Organic Chemistry, Physical Chemistry and Techniques of Chemical Measurements.

A core curriculum, structured to provide a common store of biological knowledge and skill with particular competence in molecular biology, genetics, cellular, microbial, developmental, environmental and physiological studies, is encompassed in the biology curriculum. Opportunities to utilize modern techniques and sophisticated instrumentation are provided. The basic science requirements include a knowledge of physics (12 cr.), mathematics (16), chemistry (24) and biology (31). Although electives may be selected from any of the scientific, engineering or humanities disciplines, it is recommended that biochemistry be included as well as electronics and computers. The required 32 credits of humanities include, English (12), history (3), economics (3), language (12) and humanities elective (2).

S. M. Motzkin, Chairman, Life Science Committee

SACRED HEART COLLEGE, Wichita, Kan.

We are following the curriculum as drafted in January, 1967, with the assistance of a CUEBS consultant. Eight credit hours of General Biology are taken during the freshman year. Six upper level courses of 3 credits each are added as a core for the sophomore and junior years. The students are free to choose the order of sequence, provided they have fulfilled the prerequisites in chemistry. We are requiring students either to have had high school chemistry before taking General Biology or to be taking college chemistry simultaneously.

During the fall semester, Cellular Biology, Genetics and Evolution and Developmental Biology are taught; in the spring Microbiology, Comparative Physiology and Environmental Biology are offered.

In the senior year, students work on independent projects, earning 2 to 4 credit hours and take a seminar course of one credit hour each semester. Since some students do not begin their major while freshmen, they have more courses to take during their senior year. However, we have found that it is possible to begin project research during the junior year, especially if they have a good background in chemistry.

We have added one course which can be either 2 or 3 credit hours, entitled Selected Topics. It will be offered the third time this summer. Each semester a different topic is selected on the recommendation of student interest and pursued in greater depth than is possible in any of the courses. The first topic was Radiation and Health, the second was Current Problems, and the third will be Parasites of Man. Selected Topics is open to non-majors who have had chemistry and General Biology. In the course, we have the advantage of offering current material of special interest and benefit to the students without having to add or delete courses in our bulletin. After the bounds of the topic are determined, students volunteer to prepare an annotated bibliography and a set of questions for the various aspects of the topic for discussion.

For the most part, the core curriculum is satisfactory. Judging from the comments of students who took the Graduate Record Examination, we are somewhat weak in the area of botany. We plan to place more emphasis on plant structure and function.

Sister M. Claudine Axman, Professor of Biology

SOUTHERN ILLINOIS UNIVERSITY, Carbondale, Ill.

The currently separate departments in the biological sciences make more difficult and slower the preparation of integrated courses and curricula. However, progress has been made, and more is expected. Biology curricula for the Bachelor's and Master's degrees are offered, based upon an integrated, 8 qt. hr., beginning course in biology (at the sophomore level and preceded by the physical sciences) and a series of integrated, 3 qt. hr., courses from which electives may be chosen, as well as the basic courses in the various subdisciplines.

Some choice is available even in the beginning course since one 8 hr. sequence emphasizes cellular biology and another stresses environmental biology. At the junior-senior level the student must take higher level courses basic to botany, microbiology, physiology and zoology, but may register in any one of these areas for no more than a third of the total requirement of hours in biology. In these same years he elects series of courses from such coordinated offerings as behavior, evolution, weather, paleontology, conservation, history of biology, ecology and genetics.

At present, a series of 4 qt. hr. courses to serve as a core for all biology students, is being developed. These courses will encompass the broad areas of cellular and developmental biology, genetics, organismic biology and environmental biology.

H. I. Fisher, Chairman, Department of Zoology

SOUTHERN METHODIST UNIVERSITY, Dallas, Texas

Sequential history of recent curriculum changes:

1961- Formulation of a Master Plan.

1962- Revision of the curriculum within the framework of traditional courses in an attempt to acquaint every major with the basic aspects of the biological sciences.

1963-1966 Addition of faculty, remodeling of facilities, acquisition of equipment in accordance with the Master Plan.

1966-1967 Initiation of the new program: a core of courses in biology for which every major is required to enroll, and a strengthening of requirements in regard to cognate courses. The 25 sem. hrs. core sequence is as follows: General Biology, Principles of Cell Biology, Comparative Morphology, General and Comparative Physiology, Developmental Biology, General Genetics, Environmental Biology and Seminar.

1967-1968 Continued improvement of the new courses in the core and revision of the traditional courses to modernize them and to give them broader scope; careful integration of the core courses to insure continuity and to avoid undue repetition; strengthening of the laboratory programs at all levels; formulation of a program of independent study for juniors and seniors.

Jan. 1969 The core curriculum seems to be well accepted and effective. No radical departures from this program are indicated at the present itme.

The Degree Programs in Biology:

BS—for those students who plan to pursue graduate training or to enter professional schools. Requirements: completion of core sequence, biology electives (9 hr.), mathematics through calculus, physics (8 hr.) and 8 hours of advanced work in chemistry.

BA—for those students who find it impracticable to include all the requirements for the BS degree in their curricula; primarily, those working for teacher certification. Requirements: completion of core sequence, plus 4 hr. of advanced work in chemistry.

W. B. Stallcup, Professor of Biology

SOUTHWESTERN AT MEMPHIS, Memphis, Tenn.

Core (required of majors and prerequisite to all advanced courses):

Biology of the Cell. Designed to provide the student with a basic understanding of the structure and function of the living cell and its component organelles. Molecular constituents of the cell, metaboiic phenomena, cytogenetics and cellular movement will be among the topics investigated.

Animals as Organisms. Relates molecular and cellular biology to the organismal concept, emphasizing structural and functional aspects of whole vertebrate organisms, their development, life histories, behavior, diversity and evolution.

Plants as Organisms. Similar to Animals as Organisms, stressing the organismal concept in relation to plants, with emphasis upon vascular plants.

Advanced Courses (at least one must be selected from each group):

Development Biology—Biology of the Invertebrates
Ecology—Field Biology
Microbiology—Genetics—Cytology and Ultrastructure
Plant Physiology—Animal Physiology

Additional Courses (at least one of these or one additional course chosen from those listed above must be selected):

Evolution, Molecular Biology, Radiation Biology, Biochemistry, Direct Inquiry, Tutorial
Senior Symposium (1 hr., 2 terms)

In all laboratory work we encourage students to work on their own as much as possible. For example, in the beginning sequence a student meets for a regular structured laboratory session of two hours per week. He is then asked to do an additional hour of work, at his convenience, in another laboratory room reserved for that purpose. This ordinarily consists of a pertinent exercise for which he is given minimum instructions. Advanced courses often provide time for individual projects of the student's own choosing. We also encourage students to take independent study options (Direct Inquiry, Tutorial or Honors) when appropriate. The latter may be taken in any term (Term I and II, 12 weeks each; Term III, 6 weeks). We are encouraging faculty members to take advantage of these different periods of time to vary the format of their courses so as to provide the best possible learning and teaching experiences.

The core program and the calendar are new this year, so our experience with those aspects of our program is minimal, but so far things have worked out rather well.

R. L. Amy, Chairman, Department of Biology

STATE UNIVERSITY OF NEW YORK AT BUFFALO, Buffalo, N. Y.

As part of the honors program in biology, students undertake, for credit, an independent 2 semester investigation under the supervision of a professor of their choice. We give the students an opportunity to communicate their research results to each other and to other interested faculty and students. Juniors who have been invited to join the program thus have a chance to learn something of the research effort expected of them and of the research opportunities from which they could choose. The format of a professional scientific meeting is adopted. Ten minutes are allotted for each presentation and 5 minutes reserved for questions and discussion after each paper. Each investigation comprises an integral part of the research program of the professorial supervisor, and it is evident that the students appreciate the opportunity for involvement in meaningful, ongoing research in contrast to contrived, closed-ended exercises.

In addition to the program described above, the following curriculum changes are being instituted:

1. The 2 year, 20 credit hour core program for biology majors is being expanded into a 6 semester, 24 credit hour program.
2. Undergraduate teaching is being organized into 6 biomodules which will cover all of the areas of biology described in CUEBS Publ. No. 18. Each biomodule or area will offer a basic course, some of which will be prerequisites to others and, in addition, several elective courses. We are also making provision within context of these biomodules for non-science majors and general education offerings both at the freshman and upper class levels. The ultimate outcome of this program will not be unlike the Purdue curriculum but is designed to meet particular structural peculiarities of our department.

Our University is emphasizing science for the general student, and our non-major courses are experiencing heavy enrollments. As a result of this, we are seriously considering innovations in laboratory programs that will alleviate the load on our laboratory facilities and, at the same time, make the laboratories more meaningful to non-science majors. We are using summer session pilot laboratories as means of innovating in this area.

L. Berlowitz, Co-Chairman, Biology Department

SWARTHMORE COLLEGE, Swarthmore, Pa.

Curriculum developments in biology in recent years have aimed at strengthening offerings in cellular, genetic, molecular and behavioral aspects of biology in a curriculum already strong in morphology, physiology and ecology. Toward that end, a cell biologist and a geneticist have recently been added to the staff. The following changes in offerings are already in effect:

1. Vertebrate Morphology has replaced Comparative Vertebrate Anatomy in the sophomore year. The new course stresses microscopic and developmental anatomy, along with adult anatomy of vertebrates. The microscopic aspect in part makes up for the earlier elimination of Vertebrate Histology from the curriculum. Developmental studies deal chiefly with amphibia so as to complement the subsequent course in Embryology.
2. Cell Biology is a new course offered second semester of the sophomore year, requiring concurrent enrollment in organic chemistry. It stresses ultrastructure and function of cytoplasmic constituents and techniques.
3. A revised upper division course in Cytology, dealing essentially with nuclear constituents, chromosomes, DNA-RNA, etc., affords extension of work done in Cell Biology. Again techniques are stressed.
4. Genetics is now available as a regular offering by a professional geneticist. All laboratory work is by projects, using either *Drosophila* or bacteria.
5. Biology of Animal Communities is a course dealing chiefly with animal behavior in an ecological context. Projects include studies in telemetering, circadian rhythms, group interactions, homing and population dynamics.

General changes in departmental offerings, encouraged by an all-college self-study, involve increased opportunities for undergraduate research and independent study by directed reading and stress on project-type rather than demonstrational laboratory work in all courses.

Next year our introductory course will be completely revamped. While of this date our plans are not complete, one possibility is to offer two single semester courses, neither prerequisite to the other, one essentially cellular in nature and the other frankly organismal.

It might be relevant to mention that a course in biochemistry is being offered by our Department of Chemistry for the first time this year.

N. A. Meinkoth, Chairman, Department of Biology

TENNESSEE TECHNOLOGICAL UNIVERSITY, Cookeville, Tenn.

The Biology Curriculum Committee is in the process of evaluating its present program. While this evaluation has led to some generalized recommendations, these have not yet taken the form of specific suggestions for curriculum changes. Our present schedule calls for a pilot program beginning in the summer of 1969 to be carried through the following academic year. If this program is successful, it will find its way into the university catalog of 1970-71.

It is unfortunate that such a lag exists for instituting changes in a discipline as dynamic as biology. We hope to overcome this lag in the future by building enough flexibility into our program that changes can be incorporated into courses as soon as new information and techniques become available.

As a result of the Committee discussions, I have concluded that a drastic change will take place in our second year program for majors. Vertebrate Anatomy and Embryology will probably not be recommended to second year majors. Just what will replace it is not clear yet, but the Committee is strongly considering an integrated 6 or 7 quarter program for majors which they will begin as first quarter freshmen. The Committee may recommend that majors and non-majors take the same freshman course. The conflict over this problem arises because we realize that basic needs for both groups are the same and wonder whether these needs can be met most effectively in the same course or in different courses.

Our approach to teaching the freshman laboratory has been critically examined. We question whether our laboratory, which is coordinated with our lectures, should be used mostly for lecture reinforcement. Perhaps the laboratory should be conducted as a separate course with different goals from the first year lecture course.

G. E. Hunter, Chairman, Department of Biology

TEXAS SOUTHERN UNIVERSITY, Houston, Texas

The undergraduate biology curriculum has been under review and evaluation during the past four years in an effort to avoid duplication and overlap in courses while providing some continuity of biologic ideas within a balanced curriculum aimed at producing a generalist.

We continue to offer two, first year courses. A two semester, six hour course is taught to non-majors in two lectures and one laboratory period weekly. Emphasis in this course is on man as a biological entity and how he relates to his environment. The biology majors are given a more thorough introductory course of eight semester hours credit. This course consists of essentially three parts, extending through two semesters. General biologic concepts, some presented in the introductory and others dealt with in the summation phase of the course, constitute more than one-third of the coverage. Considerable emphasis is placed on molecular and cellular phenomena. The remaining time is spent on a survey of animal and plant diversity.

During the second year our majors take one semester of Comparative Anatomy and one semester of Developmental Biology. A third year student takes one semester of General Genetics and one semester of General or Cellular Physiology to terminate the required sequence.

Six hours of biology electives may be selected from the following: Cytology (2 hr.), General Bacteriology (4 hr.), Heredity and Evolution (3 hr.), Histology (4 hr.), Immunogenetics (3 hr.), Lab. Methods in Biol. Research (4 hr.), Parasitology (3 hr.), Radiation Biology (3 hr.). Most often our students will elect to take three or four courses out of this group.

In addition, each biology major has been required during the past four years to do an undergraduate research project with a faculty member of his own choosing. We think that this innovation has been very meaningful in rounding out the training of these young people. Participation in the departmental seminar during one year is also required. Plans are underway to process some lectures and laboratory demonstrations for use in a program of audio-visual-tutorial instruction. The plans will be put into effect with the first year biology courses.

A. J. Seaton, Professor of Biology

UNIVERSITY OF ARIZONA, Tucson, Ariz.

The Department of Biological Sciences (approximately 40 members) was formed October 1, 1966, by the consolidation of the former Departments of Botany and Zoology, the freshman biology program and the teaching functions of the Fishery Biology and Wildlife Biology units. Committees were appointed to study and make recommendations relative to 1) the introductory program, 2) the undergraduate program and majors, 3) the graduate program and 4) long range planning. Follow-up action from these committees has been the result of administrative decision and in most cases has reflected a certain degree of compromise. The undergraduate core will be established in the fall of 1969 in a sequential manner preceded by basic chemistry and starting, biologically, with Organismic Analysis followed by Genetics, Cell Biology and Environmental-Population Biology. Students will major in biology, but through additional courses beyond the core, may concentrate in any area. Among these specialties are the equivalent of a major in animal science or plant science, or the student may become more specific and direct his work toward cellular biology, fishery biology, genetics, molecular biology, physiology, scientific illustration, systematics, wildlife biology, etc. The present graduate program is anticipated to articulate with the core concept. In addition, an attempt is being made to establish behavioral objectives in the core program introducing as much independent procedure as possible. Incorporated in this procedure is an academic quality control based upon the ability of the student to do something. The latter attitudes stem from the studies of the AAAS Process Approach. We anticipate the incorporation of this approach with the audio-tutorial system presently existing in areas of the department.

N. A. Younggren, Head, Department of Biological Sciences

UNIVERSITY OF CALIFORNIA, Davis, Cal.

Biology is taught in two colleges—the College of Letters and Science and the College of Agricultural and Environmental Sciences. The main emphasis has been in the traditional areas such as botany and biology or in graduate areas such as biochemistry and genetics. The problem has been to overcome institutional barriers and faculty reticence to change to the new biological sciences core concept.

Progress on the institutional barriers was to ask the faculty to form an undergraduate teaching group in biology which would be independent of departmental and college lines. This would be modeled after the graduate groups on the Davis Campus which administer graduate programs independent of college and departmental lines. These graduate groups have been very successful, and the faculty understands their mechanisms and operations. At this time the various departments in biology have been made teaching departments in both colleges, and the faculty is in the process of forming the undergraduate group in biology. It is hoped that it will be accomplished this year.

Regarding biology courses, a lower division course in biology has been in operation for some years, and it appears to be quite successful. This is a one quarter course, following which the student takes either Zoology, Botany and/or Bacteriology II. General biology courses are now offered to non-majors. In the process of formation is a Biology II course which will be the second quarter of the general offerings and could be taken in place of Botany, Bacteriology or Zoology II.

The College of Agricultural and Environmental Sciences teaching curricula have established core programs including chemistry, physics, math and biology. We are at this time waiting for the biological sciences to form the biology core so that the biological sciences can become more effective for the majors in Applied Biology.

J. H. Meyer, Dean, College of Agri. & Environ. Sciences

UNIVERSITY OF CHICAGO, Chicago, Ill.

The program for a Bachelor's degree in Biology consists of (1) Common Year courses, (2) second level non-science courses, (3) non-biology science courses, (4) second level biology courses, (5) additional requirements of particular concentration programs and (6) free electives, for a total of 42 quarter courses. In addition, demonstration of Level I competence in a modern foreign language or its equivalent (1 year of study) and passing the basic writing examination are required. A brief explanation of these six requirements follows.

1. Common Year courses. Each student takes one year-long sequence in each of humanities, social sciences, physical sciences (either Chemistry 105-6-7 or Physics 121-2-3) and Biology 105-6-7. This totals 12 quarter courses.

2. Second level non-science courses. Each student takes a second year in humanities and in social sciences. This totals 6 quarter courses.

3. Non-biology science courses. Each student takes a year-long course in chemistry or physics (whichever one was not taken to fulfill the physical science Common Year requirement), Chemistry 220-1 and Biology 200 or Biochemistry 301, Math 151-2 and a course in statistics. This totals 9 quarter courses.

4. Second level biology courses. Each student takes at least one course from six of the following seven areas: behavioral biology, cell biology, developmental biology, environmental biology, genetics, organismal biology, phylogenetic biology and systematics. Three of these courses must be laboratory courses. This totals 6 quarter courses.

5. Additional requirements of particular concentration programs. Some students choose to concentrate in one field of biology, and many of the departments in the Division of Biological Sciences have concentration programs for undergraduates. These programs have requirements over and above the requirements of the Collegiate Division of Biology, and courses taken to fulfill these requirements count as electives.

6. Free electives. There are nine free electives for a student in the program for a BA in Biology. Some of these electives, however, may have been committed in the following ways: mathematics courses prior to Math 151, courses taken to achieve Level I competence in a foreign language, courses to pass the basic writing examination and electives that are specified by particular concentration programs. The remaining electives can be used by the student to take any course for which he has the prerequisites.

A. W. Ravin, Master, Collegiate Division of Biology

UNIVERSITY OF DELAWARE, Newark, Del.

Prior to the first semester 1965, both majors and non-majors were offered a two semester sequence of General Biology in the freshman year. Beginning in 1965, a core curriculum in biology was introduced. This builds upon freshman level chemistry and mathematics (usually calculus) and starts either in the second semester of the freshman or the first semester of the sophomore year with Concepts in Biology, which serves to introduce other courses in the core. Credit for this course can be obtained by advanced placement or by special examination.

The additional courses in the core include Developmental Biology, Cellular and Molecular Biology, Genetic and Evolutionary Biology, Environmental Biology (each 4 cr.) and Senior Seminar (2 cr.). The first two were offered in 1966-67; the second two started in 1967-68 and the Senior Seminar in 1968-69.

In addition to the core, majors must take 8 credits in an area of concentration in biology. All are required to complete two semesters each of physics and organic chemistry. Physical Chemistry is recommended. Biochemistry (from Chemistry Department) can be used as an area of concentration.

G. F. Somers, Chairman, Department of Biological Sciences

UNIVERSITY OF MIAMI, Miami, Fla.

Curriculum revision is in its fourth year of implementation. The major innovation is a 6 semester core program which serves as the principal route to the BS degree. This program is being phased in year by year. The first offering was to a small group of students. Then there was a year lag for revision and finally a full-scale offering. The trial group is in its senior year, the first full-scale group is at the sophomore level, and the second full-scale group is in the freshman sequence. The trial group numbered 26 at the start. It appears that 12 will be getting degrees from this Department and that all will be continuing in graduate or professional schools next year. For the first full-scale group, we anticipated 350 and enrolled 500. This increase in enrollment could be accounted for by an increase in the proportion of the accepted students who actually appeared on campus. All of the prospective biology students were sent copies of background material on the Core Program in Biology and a recommended four year schedule. The attrition in this group was quite severe, and so the 1968 mailings were a bit stronger in stressing the challenge. Advising was tightened up to restrict enrollment in the freshman course. This fall the number of students again exceeded anticipations.

As a result of these unprecedented enrollments, the Biology Department has more majors than any other department of the College of Arts and Sciences. The excessive popularity causes serious problems in terms of physical facilities and junior teaching staff. Our laboratories are operating six days and four nights a week. The loads imposed on graduate assistants are too heavy. The Core Program in Biology is probably a little more economical on a per student basis, but the high enrollment may require some restrictions in certain aspects of the program. The most serious problems have been associated with field trip logistics and the need for duplicating equipment in order to run simultaneous laboratory sections. We presently have 175 students in Ecology and next semester anticipate 240 in an intensive modern laboratory genetics course.

The increased requirements in mathematics and the physical sciences have been well accepted by the students. The team teaching approach has worked quite well. For the most part, staff participants have been cooperative and willing to put in the extra time necessary to keep well informed of the progress in the courses. One serious problem is the qualification of graduate student assistants in the advanced courses.

E. R. Rich, Associate Dean, College of Arts and Sciences

UNIVERSITY OF MINNESOTA, St. Paul, Minn.

The College of Biological Sciences was established in 1965. The existing Departments of Botany, Biochemistry and Zoology and the newly formed Departments of Genetics and Cell Biology and Ecology and Behavioral Sciences were incorporated into the College. The Departments are administered by department heads and the College is administred by a dean and an associate dean.

In addition to departments, the College is characterized by "programs" of research which cut across departmental lines, e.g., Cell Biology, Molecular Biology, Developmental Biology. Each program is headed by a chairman whose administrative duties are minimal but whose intellectual leadership is responsible for maintaining staff and graduate programs.

A second edition of the biology core curriculum is being developed. The first addition put together nine separate courses, representing at least six departments, with almost no attempt to eliminate duplicate subject matter or to develop a central theme. This second edition represents an attempt to integrate all of biology into one course, to be presented over a period of five quarters. Students will be permitted to enter the core anytime after their second quarter at the University, and they will be permitted to take specialized subject matter courses after completion of the core.

The subject matter of biology to be presented in the core begins with biochemistry and proceeds to molecular and cell biology using molecular genetics and microbial genetics as adjuncts. Then the course will proceed to tissues, organisms and populations with physiology, development and ecology as adjuncts. Population Biology will also include the principle of population genetics. Following the five quarter course in biology, the students will be permitted to conduct relatively independent laboratory research for one quarter. As a part of their responsibility during the first five quarters of the course, each student will develop a design for the experiment he intends to do during his sixth quarter.

The University has invited representatives of the undergraduate student body to participate with the faculty in the development of the core curriculum and in its periodic evaluation. Students will also, if they so choose, serve on the departmental curriculum committees.

V. W. Woodward, Professor of Genetics

UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL, Chapel Hill, N. C.

Since 1906, U.N.C. has had Departments of Botany and Zoology that stressed graduate instruction and research, although there have been increasing numbers of undergraduate majors. A few undergraduates have also majored in bacteriology, located in the School of Medicine. In 1965, members of the Department of Botany proposed that an undergraduate major in biology be added to the existing majors, and in 1966, the Dean appointed a committee of representatives of Botany, Zoology, Bacteriology and Biochemistry to make proposals. The committee studied the matter during the year, considering CUEBS reports among other things, and submitted its report in the spring of 1967.

The committee recommended two undergraduate biology programs. One, leading to an AB, provided for considerable freedom of election of major and supporting courses by the student, with the help of his advisor. The other, leading to a BS degree, included five specified newly-designed core courses, and the supporting courses were largely required. The committee recommendations were approved, with some modifications, by the four departments and the administrative units involved during the spring of 1968. The AB in Biology program was activated in the fall of 1968, but the BS in Biology could not be offered before the fall of 1969 because of the time required for designing, staffing and equipping the new core courses.

The core courses for the BS in Biology are a 2 semester General Biology course and one semester courses in Cell Biology, Ecology and Genetics. Also required is a 2 semester hour seminar course for seniors in their final semester. The biology major is completed by three electives, no more than two in any one of the four participating departments. The physical science and mathematics requirements are as follows: 3 courses in mathematics through calculus, general physics, general chemistry, quantitative analysis (largely instrumental), organic chemistry and one elective. Fourteen non-science courses are required, 8 of them being specific University requirements, and there are 2 to 4 free electives.

Majors in bacteriology, botany and zoology will still be available, as will be the one semester introductory courses offered by each of these Departments. The undergraduate enrollment is adequate to make this freedom of choice feasible. However, the departmental majors and introductory courses may be phased out later if it develops that students predominately prefer the introductory biology courses and a biology major.

V. A. Greulach, Chairman, Department of Botany

UNIVERSITY OF SOUTH DAKOTA, Vermillion, S. D.

The outline that follows represents a core program for biology majors. Members of both the Zoology and Botany Departments have approved this outline, and the program should be implemented as quickly as possible. This program insures a uniform training for our undergraduates. The rigorous program is designed to produce a well-trained, modern biologist. The graduate program will continue to emphasize a strong ecological training, and the scope of the program must be enlarged. New courses offered will depend on recruitment of new faculty.

I. Biology courses required of all majors:	Sem. Hrs.
Biology 1 and 2	8
Genetics	4
Plant Morphology	3
Animal Anatomy and Development	4
Ecology	3
Cellular Physiology	3
	25
Biology Electives (3 courses)	9-11
Minimum	34

II. Chemistry requirements for all biology majors:	Sem. Hrs.
General Chemistry 1a	4
Fundamentals (3b) or Principles of Chemistry (5b)	4
Chemical Equilibria 11	2
Organic Chemistry 33a,b	8
Total	18

III. Mathematics requirements:	Sem. Hrs.
Elementary 1 and 21 or Elementary Calculus 21 and 22	8
Total	8

IV. Physics requirements:	Sem. Hrs.
Physics 3 and 4	8
Total	8

T. Van Bruggen, Chairman, Department of Botany

WASHINGTON STATE UNIVERSITY, Pullman, Wash.

As of the fall semester 1968, our interdepartmental one year (8 hr.) laboratory course in General Biology has completely replaced the former introductory botany and zoology courses. The botany course was given for the last time during AY 1967-68, and a corresponding zoology course was discontinued the previous year. The faculty teaching the new course now includes no one who had been involved in the former introductory courses; however, they all have appointments in one of the regular departments: Bacteriology, Botany or Zoology. The TAs for the new course are graduate students in the Bacteriology, Botany, Entomology, Plant Pathology, Zoology Departments and the general biology program. Selection of the TAs is strongly influenced by the faculty teaching the courses, but their distribution among the various fields is maintained at an agreed-upon balance of the major disciplines.

Since the new course has a chemistry prerequisite, we offer an optional 1 hour laboratory course to accompany our 3 hour, 1 sem. biology course for non-majors; this arrangement has made it possible for students to obtain biological laboratory experience without having to take the course for majors. Owing, however, to difficulties in scheduling, we have now agreed to offer two, 1 semester biology courses for the non-majors; one a 4 hour course with laboratory and the other the long-standing 3 hour lecture-only course. (It should be pointed out, however, that extensive use of demonstrations, many by means of closed-circuit TV, helps to provide some exposure to laboratory situations for students in the 3 hr course.) The new 4 hour course will probably be initiated during the spring semester, 1969.

We are now planning an advanced undergraduate sequence of two, 4 hour (or one, 4 hour and one, 3 hour) courses covering physiology, cellular and molecular biology. It is hoped that these courses will be initiated during AY 1969-70. Chemistry through organic and one year each of physics and calculus will be among the prerequisites for the advanced course sequence. A new General Ecology course is now ready for AY 1969-70; it will serve students wishing to have an introductory course before taking our specific plant or animal ecology courses.

A. Hecht, Chairman, Department of Botany

UTAH STATE UNIVERSITY, Logan, Utah

The biology departments in the College of Science at Utah State University include Bacteriology-Public Health, Botany and Zoology. A one quarter Introductory Biology course has been taught for two years on an experimental basis. The decision has been made to expand this to a beginning core course, to cover a full year of general biology. This will be under the supervision of a division of biology with representatives from the three departments mentioned.

The complete core program in biology probably will include a series of 4 or 5 courses beyond the first year, with a likelihood of one quarter each being devoted to Genetics, Evolutionary Biology, Cellular Biology, Developmental Biology and Ecology. Students majoring in one of the specific areas represented by the 3 departments in the College of Science need not take all of the courses.

It is anticipated that a program will be developed leading to the BS degree in biology, and presumably the core curriculum in its entirety will be required of all students completing this major. It probably will be designed for the specific purpose of preparing students for graduate work in biology.

Terminal programs exist in the 3 departments preparing the students for technologist careers at the baccalaureate level. In addition, departmental programs are available in each of the departments designed to prepare students for graduate work in the specific fields concerned.

R. M. Johnson, Dean, College of Arts and Sciences

WESTERN KENTUCKY UNIVERSITY, Bowling Green, Ky.

General biology has, up to the present time, been taught at two levels, one at the service level and the other at the majors level. Since we feel that both groups of students deserve the best possible course and that both groups have the same basic needs in a conceptual approach to biology, these two courses were replaced by a single course in the fall semester of 1968. The course is designed around the unifying concepts of biology and will be taken by majors and non-majors alike, with the laboratory being optional for non-majors.

Three courses, one concerned with comparative aspects of plants, the second with comparative aspects of animals and the third concerned with microorganisms, complete the formally required biology core program for majors. Other students have need of biology course work where differences among organisms are emphasized in less time than is permitted by the three courses mentioned above. Consequently, a one semester course is offered as a service to these non-majors.

In addition to the above formally required core, most biology majors complete a course in physiology (animal or plant), genetics and ecology. Discussions are now under way, which probably will result in these three subject areas being required of all majors.

Science courses (other than biology) required of biology majors are: mathematics (2 sem.), chemistry (2 sem. required plus organic chemistry highly recommended), physics (2 sem.). Discussions are under way, which probably will result in the mathematics requirement being extended to include either statistics or calculus, the chemistry requirement to include organic and the addition of an earth and space science course.

The present (caps) and anticipated (non-caps) biology core thus becomes:

	BIOLOGY	CHEM.	MATH.	PHYSICS	EARTH & SPACE
Fr.	GEN. BIO.	INORG.	ALG. & TRIG.		
	BOTANY	INORG.	CALC. & ANAL. GEOM.		
So.	ZOOLOGY	Organic	Calc., Stat. or	COL. PHYS. I	
	MICROBIO.	Organic	Computer Sci.	COL. PHYS. II	
Jr.	Genetics Physiology (Pl., An. or Cell Bio.)				Earth & Space Sci.
Sr.	Ecology Seminar				

E. O. Beal, Chairman, Department of Biology

WILLIAMS COLLEGE, Williamstown, Mass.

The College has an academic year calendar consisting of a 2 sem., 4 course program divided by an intersession period of 4 weeks during which students concentrate on a single subject. The Department of Biology continues to operate a core program within a new curriculum which places particular emphasis on the areas of molecular and environmental biology. The aim of this program is to introduce the undergraduate to the most significant questions posed by modern biological concepts and to give him direct experience with techniques being used in attempts to answer these questions.

Following a one semester introductory course, which presents selected biological concepts, the interested student takes a second semester entitled Introduction to Cellular Metabolism. Here he becomes acquainted with some major biochemical principles and is introduced to the bases of organic chemistry. Sophomores elect 2 semesters of biology, the first semester offering a choice between Plant Cell Physiology and Environmental Biology. The second semester offers a course in Form and Function, which includes many topics previously taught under Comparative Anatomy and General Physiology. The emphasis, however, is on representative life forms rather than vertebrates *per se*. A year course in organic chemistry, which emphasizes the structure of matter, is taken concurrently. Juniors take an integrated year course in Genetics and Development. In their first semester, seniors elect Cellular Physiology and in the second semester choose either of 2 seminar courses in Advanced Molecular Biology and Population Biology. These courses occasionally have joint meetings and a number of laboratories in common.

Electives in Ultrastructure, Animal Behavior and Biometry are offered in addition to the major course.

Qualified students may elect to concentrate in a 2 or 3 semester program of Honors research which culminates in a thesis. During the intersession period, biology majors may register in specialized instrumentation programs, continue in Honors research or attend seminars dealing with restricted topics which are often of an interdisciplinary nature. Readings in the primary or secondary literature are favored over the more conventional textbook-laboratory manual approach.

A major aspect of all course programs is the attention given to individual or group research projects in the laboratory. Many of these result in joint staff-student publications.

W. C. Grant, Jr., Chairman, Department of Biology

BREAKING THROUGH A BARRIER: BIOLOGY FOR GENERAL PHYSICS STUDENTS

Waking people up to the fact that real science doesn't fit into the nicely constructed boxes, called chemistry, biology, physics, etc., that we have built for them has consistently been the toughest uphill battle that the college commissions have had to fight. Obviously, biologists have much to gain from activities that make the barriers more easily penetrable, but successes to date have been few. Perhaps it is because we have assumed too easily that the flow from one field to the next is largely one way—from physics and chemistry to biology, for example—and on finding that the people capable of generating such flow are simply not interested, we have decided that the blame is all theirs.

Our sister commission in agriculture, CEANAR, recently took steps to upset this bit of rationalization by calling together a small working group of biologists, physicists and agricultural scientists to see if flow could be started from biological and agricultural fields toward physics, specifically to the teacher of the physics courses that the biology and agriculture student must take. The aim of this meeting, which was chaired by Arnold Strassenburg of the American Institute of Physics and was held in Chicago on November 21-22, 1968, was to examine the idea of preparing a sourcebook that would show college physics teachers how a knowledge of elementary physics can enhance explanations of biological events, the hope being that physics teachers can then be encouraged to add many biological examples to courses that have seldom reached beyond physics and engineering for illustrations.

The participants were enthused by the idea of passing biological material along to the physicists and were pleased to find that they could talk about things that rose well above the simple barnyard examples and cute biological stunts that have dominated this interface heretofore. The idea of one or a series of paperbacks was rejected, however, in favor of modules that would be placed in appropriate journals (e.g., *American Journal of Physics)* and might eventually be bound in collected form.

A module would center on a single topic in physics, say viscosity, and would provide what one participant called a "vignette of the physical concept *per se* together with examples of its applicability to very real biological problems." Thus, blood and sap flow, water transport in trees and protoplasmic streaming (a non-Newtonian case) could be applied directly to a discussion of viscosity that was begun in the manner with which the physics teacher is most comfortable. Numerous other physical topics were suggested, and a collection of associated biological examples was begun. Conceivably, many modules can be oriented toward problem-solving and can be used in the badly needed individualization of these physics courses.

The project will continue under the joint sponsorship of CEANAR and CUEBS, with the initial modules to be prepared by selected individuals from the working group. Physicists, biologists, and agricultural scientists, who have an interest along this line and who might like to try their hand at preparing a module or have ideas from their own experience on ways to tie good biological examples to physical principles, are urged to contact either of the commissions' staff.

Dana L. Abell, Associate Director, CUEBS

RECENT CHANGES IN COSIP

Since 1967, the National Science Foundation has offered financial support to predominantly undergraduate institutions under its College Science Improvement Program (COSIP). Grants of up to $300,000 are available to implement proposals for general institutional development in the sciences. Of the approximately 600 institutions considered by NSF to be eligible for the program, 75 had received grants by the end of 1968. Most of the proposals so far have requested support for such things as faculty development, purchase of equipment, support of undergraduate activities and curriculum development. However, there is no finite list of supportable projects; the program is "wide open" in this respect. Most of the proposals have included biology as one of the areas to be strengthened.

Initially COSIP accepted proposals from individual institutions only. The program has recently been extended, however, to include support of (1) consortium-type activities among four-year institutions and (2) activities involving groups of two-year colleges and cooperating four-year institutions. The COSIP program offers institutions an opportunity to gain momentum for making the changes they feel to be important for their future. The acceptance of proposals involving two-year colleges is a welcome expansion of the program, and it demonstrates NSF's concern with development at all levels of undergraduate education.

The following institutions have received COSIP grants:

Northern Arizona University, Flagstaff, Ariz.
Humboldt State College, Arcata, Cal.
Occidental College, Los Angeles, Cal.
University of Redlands, Redlands, Cal.
University of Hartford, West Hartford, Conn.
Stetson University, Deland, Fla.
North Georgia College, Dahlonega, Ga.
MacMurray College, Jacksonville, Ill.
Monmouth College, Monmouth, Ill.
Roosevelt University, Chicago, Ill.
Earlham College, Richmond, Ind.
Manchester College, North Manchester, Ind.
Wabash College, Crawfordsville, Ind.
Central College, Pella, Iowa
Cornell College, Mt. Vernon, Iowa
Drake University, Des Moines, Iowa
Grinnell College, Grinnell, Iowa
University of Northern Iowa, Cedar Falls, Iowa
Berea College, Berea, Ky.
Centre College of Kentucky, Danville, Ky.
Louisiana Polytechnic Institute, Ruston, La.
Hood College, Frederick, Md.
Washington College, Chestertown, Md.
Amherst College, Amherst, Mass.
Mount Holyoke College, South Hadley, Mass.
Southeastern Massachusetts Technological Institute, North Dartmouth, Mass.
Wheaton College, Norton, Mass.
Williams College, Williamstown, Mass.
Worcester Polytechnic, Worcester, Mass.
Hope College, Holland, Mich.
Bemidji State College, Bemidji, Minn.
St. Mary's College, Winona, Minn.
Winona State College, Winona, Minn.
Nebraska Wesleyan University, Lincoln, Nebr.
Drew University, Madison, N.J.
Fairleigh Dickinson University, Rutherford, N.J.
St. Peter's College, Jersey City, N.J.
Elmira College, Elmira, N.Y.
East Carolina University, Greenville, N.C.
North Carolina College at Durham, Durham, N.C.
St. Andrews Presbyterian College, Laurinburg, N.C.
University of North Carolina, Greensboro, N.C.
Valley City State College, Valley City, N.D.
University of North Dakota, Grand Forks, N.D.
Central State Universtiy, Wilberforce, Ohio
The College of Wooster, Wooster, Ohio
Kenyon College, Gambier, Ohio
Miami University, Oxford, Ohio
Oberlin College, Oberlin, Ohio
Wittenberg University, Springfield, Ohio
Reed College, Portland, Ore.
Willamette University, Salem, Ore.
Beaver College, Glenside, Pa.
Dickinson College, Carlisle, Pa.
Franklin and Marshall College, Lancaster, Pa.
Gettysburg College, Gettysburg, Pa.
Lincoln University, Lincoln, Pa.
Rosemont College, Rosemont, Pa.
Wilkes College, Wilkes-Barre, Pa.
Augustana College, Sioux Falls, S.D.
South Dakota School of Mines and Technology, Rapid City, S.D.
University of South Dakota, Vermillion, S.D.
Southwestern at Memphis, Memphis, Tenn.
Tennessee Technological University, Cookeville, Tenn.
East Texas State University, Commerce, Texas
College of William and Mary, Williamsburg, Va.
Emory and Henry College, Emory, Va.
Hampden-Sydney College, Hampden-Sydney, Va.
Hampton Institute, Hampton, Va.
Washington and Lee University, Lexington, Va.
Central Washington State College, Ellensburg, Wash.
Davis and Elkins College, Elkins, W. Va.
Beloit College, Beloit, Wisc.
Lawrence University, Appleton, Wisc.
Ripon College, Ripon, Wisc.

For further information about COSIP, contact: College Science Improvement Program, Division of Undergraduate Education in Science, National Science Foundation, Washington, D.C. 20550.

Viewpoints!

Thomas G. Overmire, Staff Biologist, CUEBS

(Ed. Note: Viewpoints! alternates among members of the Executive Staff; it is intended to reflect their individual views and not necessarily those of CUEBS.)

Because of a variety of pressures, many colleges in the "developing institutions" category are finding themselves being moved, inexorably, toward offering graduate programs. In many cases, I sense that this broadening of responsibilities is being accepted with a degree of resignation. The prestige and professional satisfaction associated with training graduate students can be great, but graduate programs are expensive, and the pressures and challenges accompanying them are of a different nature than those which undergraduate instruction faces.

As I talk with biologists from such institutions, I hear a common comment, "We plan to specialize in environmental biology in our MS program because of our unique situation here in this lake area [or forest, prairie, seashore, mountain, marshland, desert—pick one]. And, of course, most of our faculty has been trained in areas of biology which will fit under an ecological umbrella without too much discomfort."

I am not suggesting that such reasoning is necessarily bad. In fact, I applaud the desire to have a banner (or a field station!) around which to rally, and I agree that the area of concentration should certainly be within the interests and capabilities of the faculty members who will be involved.

My concern, though, is that many departments seem to be choosing the ecological path because it is the most expedient rather than because it is the most desirable. I question the quality of the curriculum that will be offered in such situations. Will it reflect modern concerns of population dynamics and systems analysis, or will it consist of traditional courses in spring flora and ornithology? Unless the graduate will feel at home using such tools as mathematics and physical chemistry, for instance, he may not have a viable future.

But if we are committed to offering a graduate degree, how can we insure that the program will be worthwhile? I suggest that it may call for "re-tooling" of the present faculty and hiring new faculty with different orientations, as well as upgrading course offerings. The programs that seem to me to have the greatest potential for producing sound, contemporary ecologists are those which will bring an interdisciplinary group together—biochemists, meteorologists, statisticians and psychologists as well as biologists. A graduate program that involves only biologists or which does not utilize knowledge outside of classical ecology will be short-changing its students.

There is no easy road to graduate training, but if a college does move in this direction, the program must be well thought out and not just a compromise. In any case, we must realize that just any background in biology does not automatically prepare us to offer successful graduate programs in environmental biology. Ecology is developing too rapidly to permit us the luxury of spawning mediocre graduate programs as expediencies. No matter where the emphasis, let us make sure that our programs produce graduates prepared to face the complex problems of biology from competitive positions.

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8. Report of the Midwestern Regional Conference on Courses and Curricula in the Biological Sciences. February, 1965.
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15. Biology in a liberal education: report on the Stanford Colloquium. February, 1967.
16. * Guidelines for planning biological facilities. August, 1966 (materials including description of facilities consultant service).
19. Biology for the non-major. October, 1967.
20. * Testing and evaluation in the biological sciences. November, 1967, Reprinted by OBE/AIBS, October, 1968.

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